Exploring the Biochemical Potential of Olive for Economic Development in Lagging Region; Adamzai, KPK, Pakistan

Amna Anwar

Svwera90@gmail.com

School of Biochemistry

Minhaj University, Lahore Pakistan

Shahzad Bashir

Shahzad1840@gmail.com

School of Biochemistry

Minhaj University, Lahore Pakistan

Abstract

Pakistan is suffering from economic crisis for the last few years. The agriculture has substantial role in development of Pakistan. The crop olive is under consideration as a profitable crop in Punjab. There has been a number of projects working on biochemical importance of olive as food antimicrobial, antioxidant, and anticancer agent. Olive is used as fruit and source of oil. Moreover, the leaf extract has several bioactive compounds that can be used for medicinal purpose. Previous work on olive reveals that it could grow on non-agricultural land as well. So, olive crop could be grown on Adamzi region of KPK Pakistan. An area with less natural and technology resources. In addition, the less educated people could take the advantage of biochemical compounds of its leaf extract by using simple techniques of leaf tea and olive pickle.

Keywords

Olive, Antimicrobial, Antioxidant, KPK, Biochemical compounds

Introduction

For the last few years Punjab has been working on olive referring it as profitable crop. In district Pothohar research was conducted. It concludes that olive is a profitable crop with respect to benefit-cost ratio, net present value and internal rate of return. (Shoaib et al 2021)

Olive Production and Utilization

Olive (Olea europaea) is a key agricultural crop globally, renowned not only for its fruits and oil but also for the wood and leaves. In 2014, olive production notably reached 28,241,809 tons across 9,922,836 hectares worldwide, according to FAOSTAT's 2016 data. The cultivation of olives is primarily concentrated in the Mediterranean region, accounting for 98% of global production (Ghanbari et al., 2012). Olives are cultivated predominantly for their oil and for consumption as table olives. However, a substantial amount of olive leaves, a byproduct of agricultural practices, are also generated. These leaves have traditionally been used as animal feed or composted, but there's a growing interest in utilizing them for their extract and tea, owing to their traditional medicinal uses throughout the Mediterranean. (Jilani et al., 2016)

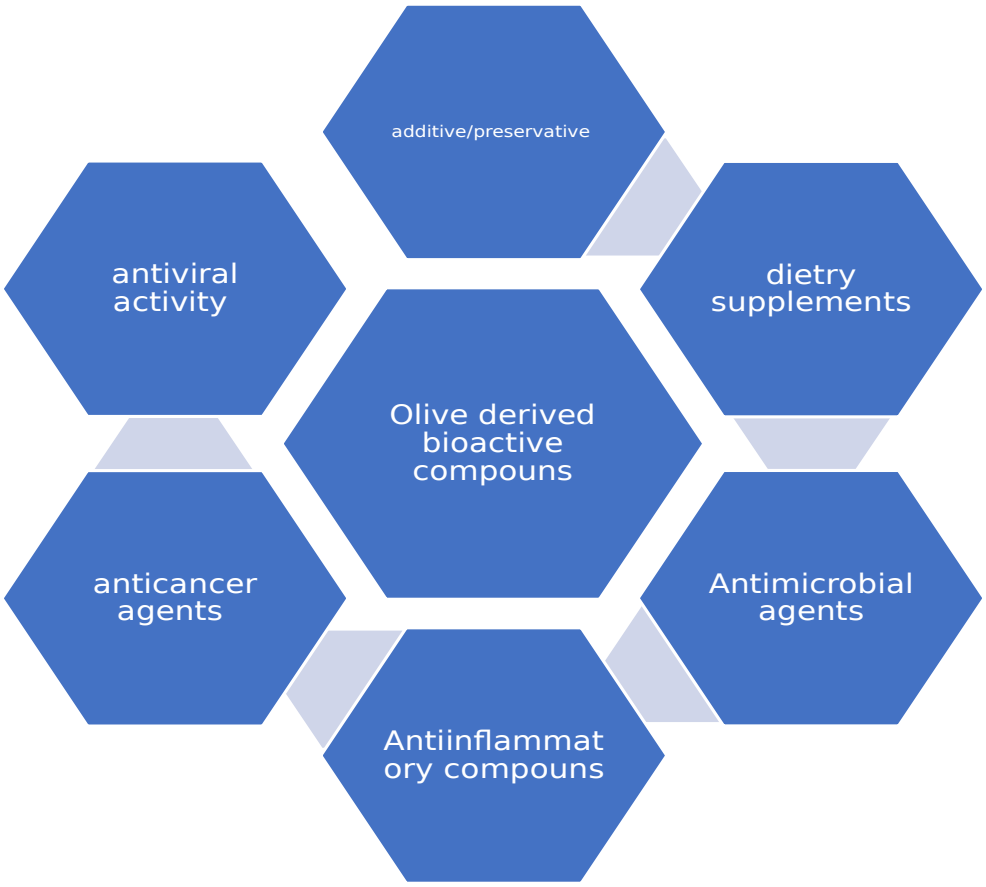
Potential for Olive Cultivation in Pakistan

Globally, there are approximately 2500 olive varieties, with 250 recognized as commercial varieties by the International Olive Oil Council. In Pakistan, a significant potential for olive cultivation is identified, especially in the province of Punjab, which has declared the Pothohar area as "Olive Valley". This region, due to the presence of wild olives, demonstrates the feasibility of successful olive cultivation, which could significantly impact the socio-economic and health conditions locally. Despite spending USD 1.7 billion annually on oilseed imports, the cultivation and domestication of olives in areas like Punjab present a credible alternative. (Fakhra khanum et al 2016)

Health Benefits and Industrial Applications of Olive Compounds

Research underscores the importance of plant polyphenols and bioactive compounds found in olives and other plants for their numerous health benefits, including antimicrobial, antioxidant, anticarcinogenic, and antiviral properties. These compounds are increasingly being recognized for their potential to prevent certain cancers and cardiovascular diseases. Moreover, the interest in utilizing plant bioactive compounds in the cosmetics, food, and pharmaceutical industries as additives, preservatives, and dietary supplements is on the

rise, highlighting the versatile applications of olives beyond their traditional uses.



Review of literature

Comparative study of Biochemical parameters of olive

Physical and Chemical Characteristics of Pendallino Olive Cultivar Oils

The study aimed to evaluate the physical and chemical characteristics of Pendallino olive cultivar oils from various cities of Khyber Pakhtunkhwa and compare them with the international standard set by the Olive Oil Council for Virgin olive oil. Virgin olive oils (VOO) were extracted using pressing and centrifuging of olive fruits from specific regions of Khyber Pakhtunkhwa, and then tested for various parameters. These parameters included acidity, peroxide level, ultraviolet spectrophotometric analysis (k232 and k270), total phenol content, and chlorophyll pigment. The results indicated that all the tested properties of the oils fell within the acceptable range established by European regulations for virgin olive oil. Additionally, the fatty acid profiles Physical and Chemical Characteristics of Pendallino Olive Cultivar Oils (Fernandez et al 1996, Gutiérrez et al 1992)

Evaluation of Oils' Physical and Chemical Properties

The findings suggested that the oils exhibited significant physical and chemical properties, meeting the criteria for pureness and excellence as edible oil. The total phenol content of the oils ranged from 114 to 125 mg/kg, indicating strong antioxidant activity. The study also highlighted the importance of chlorophyll pigments, aroma components, and pheophytin for the absorption of olive oil in the body (Atta ullah 2018). Fatty acids present in olive oil are gadoleic (C20:1) margaric (C17:0) Myristic (C14:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3) stearic (C18:0), palmitoleic (C16:1) and palmitic acids (C16:0). Moreover, eicosenoic acids is present in trace amount. (Silva et al., 2006) The results indicated that the oils from the different regions of Khyber Pakhtunkhwa can be used as a source of edible oil for human consumption. Overall, the study concluded that the oils met the international standards for virgin olive oil, with the Lower Dir cultivar showing exceptional qualities.of the oils were analyzed using gas-chromatography. The study found high percentages of oleic acid (ranging from 60.3 to 74.3%) and low levels of arachidic acid in the oils. The Lower Dir cultivar, in particular, demonstrated superior qualities. (Atta ullah et al 2018)

sample	Palmitic acid	Palmitoleic Acid	Linoleic acid	Oleic acid	Linolenic acid	Stearic acid	Arachidic acid
Bajur	8.99	1.47	16.5	60.3	1.03	2.24	0.14
Karak	6.5	0.94	10.2	71.5	0.61	3.31	0.56
Lower Dir	7.771	1.04	12.3	67.5	0.88	2.65	0.13
Peshawar	5.55	0.35	7.07	74.3	0.34	3.33	0.46

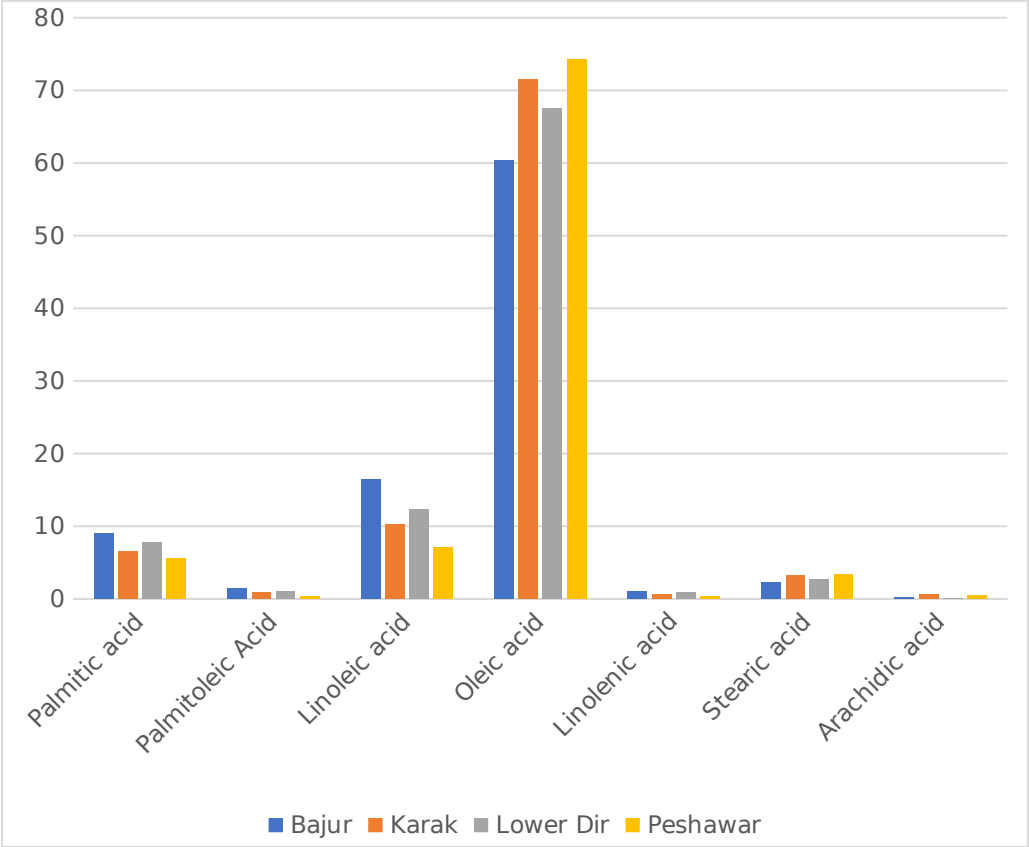


Figure 1 Graph represents Atta ullah work published in 2018 narrating the percentage of oleic acid and arachidic acid

Potential uses of olive by-products in various industries

The paper discusses the potential uses of olive leaves and fruits, as well as by-products of olive processing, in various industries. Olive is a widely cultivated crop, especially in the Mediterranean region, and its leaves are often discarded during harvesting and pruning. However, these leaves can be used to produce olive leaf extract, which has traditional medicinal uses and contains bioactive compounds with antimicrobial, antioxidant, and anticancer properties. Additionally, the paper highlights the importance of extracting valuable bioactive compounds from olive waste for potential applications in the food industry. First oil extraction called crude cake; has comparatively high oil (9%) and water (24%) contents. However, storage is difficult because it is rapidly oxidized on exposure with air (Uribe et al., 2015).

Bioactive compounds present in olive leaves and fruits

The main bioactive compounds present in olive leaves and fruits are secoiridoids, triterpenes, flavonoids, hydroxytyrosol, and polyphenols. These compounds offer innate resistance against pathogens and insects and have various health benefits, such as improving lipid metabolism and protecting against cardiovascular diseases. Furthermore,

oleuropein, the most abundant phenolic component in olives, can improve the oxidative stability and antioxidant capacity of edible oils. (Fakhra Khanum 2016)

Olive leaf extract as a natural antimicrobial agent

Numerous studies on animal model, narrated that olive leaves can decline arrhythmia, enhance blood flow, decline blood pressure in the coronary arteries and inhibit intestinal muscle spasms. They comprise antimicrobial properties against some microorganisms such as fungi, bacteria, mycoplasma and toxin of them (Benavente-Garcia et al., 2000; Furneri et al., 2002).

The research also discussed the use of olive leaf extract as a natural antimicrobial agent against various bacteria, viruses, and parasites. It highlights the potential for incorporating olive leaf extract into active packaging materials to preserve food and inhibit the growth of pathogens. Natural antimicrobial agents extracted from olive leaves are considered safer and more effective than synthetic antioxidants and antimicrobial agents.

Development of cost-effective technologies for olive extract

In the context of Pakistan, it emphasizes the need to develop cost-effective technologies for extracting high-value active compounds from indigenous olive varieties. Previous studies have characterized the antioxidant and antimicrobial properties of olive leaves and fruits, develop olive fruit powder and olive leaf tea, evaluate their quality, and prepare olive leaf extract-coated plastic films for active packaging. The effectiveness and antimicrobial potential of these films against selected food pathogens coulf be determined. The potential utilization of olive waste products and the development of methodologies for better use of olive extract in food preservation and public health awareness are important areas to explore.

(Fakhra khanum 2019)

In-vitro research conducted by Abdul Rauf et al 2023 revealed that a compound Ferruginan that is extracted from Oleoa Ferruginea R could have significant cure for diabetes, bacterial diseases and diabetes. It was proposed by utilizing docking studies that Ferruginan can inhibit AMPK, COX-1 and COX-2. Furthermore, it could be substantialy important for the inflammatory disease as it could interact with the TNF-alpha.

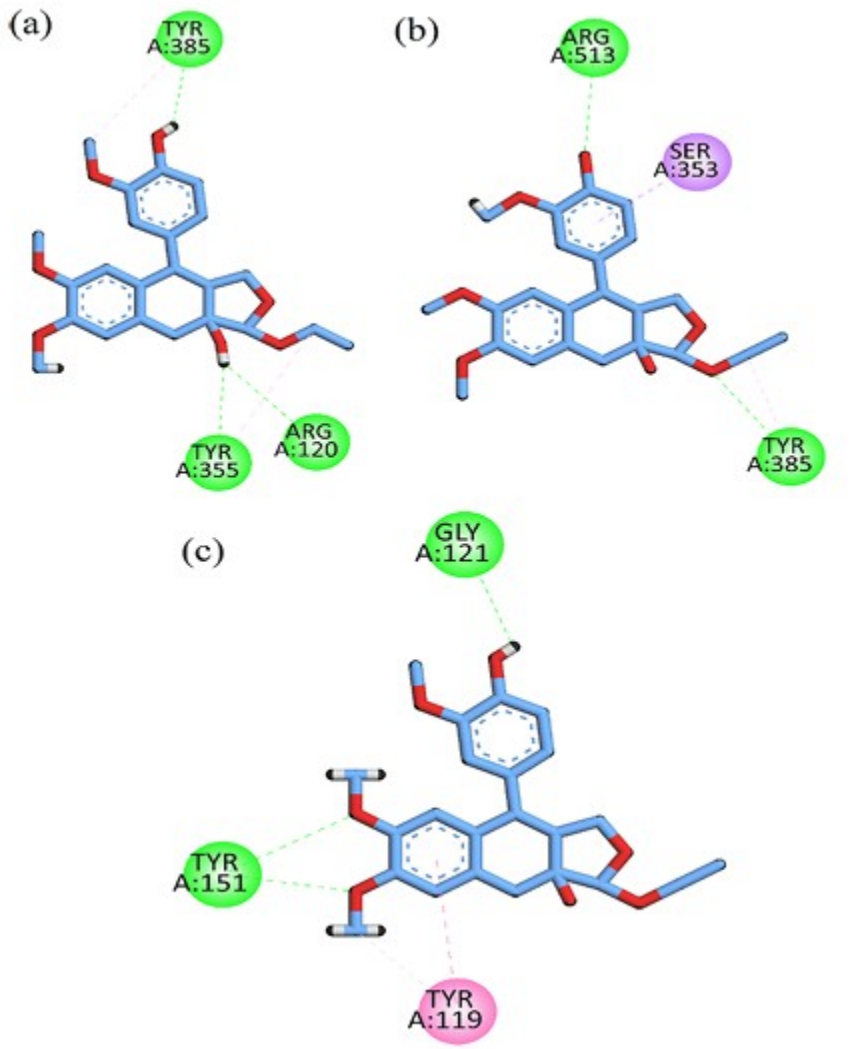


Figure 2 indicates the interaction of Ferruginan with (a)COX-1 (b) COX-2 and (c)TNF-alpha (Abdul Rauf et al 2023)

Conclusion

Agriculture is playing a significant role in the country's development. In Punjab, there is growing interest in cultivating olive crops due to their potential profitability. Numerous projects have been launched to explore the biochemical benefits of olives, which include their antimicrobial, antioxidant, and anticancer properties. Olives are not only valued as a fruit but also as a source of oil, while their leaf extracts contain bioactive compounds with medicinal potential. Previous research has shown that olives can thrive not only on agricultural land but also on non-agricultural terrain, suggesting potential for cultivation in the Adamzi region of KPK, Pakistan, an area characterized by limited natural and technological resources. Furthermore, the utilization of olive leaf extract for medicinal purposes through simple techniques such as leaf tea and olive pickle could provide opportunities for the less educated population in the region.

Author Contributions

A.A; writing-review and editing, A.A and S.B. All authors have read and agreed to the published version of the manuscript.

Copywrite statement

A.A and S.B are transferring the copywrite to publish the article and store it for public use.

Data availability

The data is publicly available at archive

Confirmation Statement

It is confirmed that all methods were carried out in accordance with relevant guidelines and regulations.
Informed consent was obtained from all subjects
It is confirmed that all experimental protocols were approved by a Minhaj University, Lahore ethical review committee.

Conflict of Interest

A.A and S.B declare that they have no conflict of interest.

References

http://faostat.fao.org/site/567/DesktopDefault.aspx?PageID=567#ancor (verified 1 June 2016).

Uribe, E., A. Pasten, R. Lemus-Mondaca, A. Vega-Gálvez, I. Quispe-Fuentes, J. Ortiz, and K. Di Scala. 2015. Comparison of Chemical Composition, Bioactive Compounds and Antioxidant Activity of Three Olive-Waste Cakes. J. Food Biochem. 39(2): 189–198.

Silva, S., L. Gomes, F. Leitao, A.V. Coelho, and L.V. Boas. 2006. Phenolic compounds and antioxidant activity of Olea europaea L. fruits and leaves. Food Sci. Technol. Int. 12(5): 385–395.

Benavente-Garcıa, O., J. Castillo, J. Lorente, A. Ortuno, and J.A. Del Rio. 2000. Antioxidant activity of phenolics extracted from Olea europaea L. leaves. Food Chem. 68(4): 457–462.

Furneri, P.M., A. Marino, A. Saija, N. Uccella, and G. Bisignano. 2002. In vitro antimycoplasmal activity of oleuropein. Int. J. Antimicrob. Agents 20(4): 293–296.

Fernandez-Escobar, RF., Benlloch, MB., Barranco, DB., Duenas, AD., & Gañán, JG. (1996). Response of olive trees to foliar application of humic substances extracted from leonardite. Scientia Horticulturae, 66(3-4), 191-200.

Gutiérrez-Rosales, FG., Garrido-Fernández, JG., Gallardo-Guerrero, LG., Gandul-Rojas, BG., & Minguez-Mosquera, MIM. (1992). Action of chlorophylls on the stability of virgin olive oil. Journal of the American Oil Chemists Society, 69(9), 866-871.

Abdur Rauf a, Bassam O.A., Naveed M., Umer R., Anees A.K., Yasir A., Ahood K., Zafar Ali Sha., Gauhar R., (2023)In vitro anti-inflammatory, antidiabetic, antibacterial, and in silico studies of Ferruginan A isolated from Olea ferruginea Royle (Oleaceae) α Saudi Pharmaceutical Journal 31 (2023) 101868

Ata Ullah, Azmat A.A., Afia Z., Muhammad M., Said B., Muhammad Y., Maryam R., and Shahida S., 2018 Comparative study of quality parameters of extra virgin olive oil from different regions of Khyber Pakhtunkhwa, Pakistan Pure Appl. Biol. http://dx.doi.org/10.19045/bspab.2018.70032

Fakhra khanum Exploring antimicrobial and antioxidant potential of Olea europaea (olive) extract for food application 2019 https://prr.hec.gov.pk/jspui/handle/123456789/16508

Rahele G.,1 Farooq A., Khalid M. A., Anwarul-Hassan G., and Nazamid S., 2012 Valuable Nutrients and Functional Bioactives in Different Parts of Olive (Olea europaea L.)—A Review Int J Mol Sci. 2012; 13(3): 3291–3340.

Hanène J., Antonio C., Reyes B., Moktar H., 2016 Improved bioaccessibility and antioxidant capacity of olive leaf (Olea europaea L.) polyphenols through biosorption on Saccharomyces cerevisiae. Volume 84, June 2016, Pages 131-138